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Inventors: Masanori NANBU, Toshio TAMURA, Kohji IWAMOTO, Yukio FUKUI

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Class 345 COMPUTER GRAPHICS PROCESSING, OPERATOR INTERFACE PROCESSING, AND SELECTIVE VISUAL DISPLAY SYSTEMS

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418 COMPUTER GRAPHICS PROCESSING

- 419 . Three-dimension
- 420 .. Solid modelling
- 421 .. Hidden line/surface determining
- 422 ... Z buffer (depth buffer)
- 423 .. Tessellation
- 424 .. Voxel
- 426 .. Lighting/shading
- 427 .. Space transformation
- 428 . Adjusting level of detail
- 581 . Attributes (surface detail or characteristic, display attributes)
- 582 .. Texture
- 583 ... Solid Texture
- 584 ... Bump map
- 585 ... Non-planar surface
- 586 ... Mathematically defined
- 587 ... MIP map
- 588 ... Repeating pattern
- 589 .. Color or intensity
- 590 ... Gamut clipping or adjustment
- 591 ... Color processing in perceptual color space
- 592 ... Transparency (mixing color values)
- 593 ... Color selection
- 594 Using GUI
- 595 Expert system or AI
- 596 ... Dither or halftone
- 597 Color
- 598 Spatial
- 599 Spatial
- 600 ... Color bit data modification or conversion
- 601 Using look up table
- 602 Plural look up tables
- 603 Format change (e.g., NTSC to RGB, RGB to composite, XYZ to RGB)
- 604 Color space transformation (e.g., RGB to YUV)
- 605 Change in number of bits for a designated color (e.g., 4 bits to 8 bits, 8 bits to 4 bits)
- 606 .. Interpolation of attribute values across object surface
- 607 ... In perspective
- 608 ... Tri-linear
- 609 ... Bi-linear
- 610 ... Linear
- 611 .. Anti-aliasing or image smoothing
- 612 ... Save attributes for each object affecting a given pixel
- 613 ... Subpixel processing
- 614 ... Pixel fragment
- 615 ... Convolution technique
- 616 ... Error diffusion

<u>617</u>	.. Contrast
<u>618</u>	.. Image with abnormal condition
<u>619</u>	. Graphic manipulation (object processing or display attributes)
<u>620</u>	.. Clipping
<u>621</u>	... Based on model of objects
<u>622</u>	.... Testing or using bounding shape (e.g., bounding box sphere)
<u>623</u>	.... Object clipped to view volume
<u>624</u>	.... Object clipped to another object
<u>625</u>	... Based on image data
<u>626</u>	.... Masking
<u>627</u>	.... Non-rectangular array
<u>628</u>	.... Rectangular region
<u>629</u>	.. Merge or overlay
<u>630</u>	... Combining model representations
<u>631</u>	... Reducing redundancy
<u>632</u>	... Placing generated data in real scene
<u>633</u>	.... Augmented reality (real-time)
<u>634</u>	... Image based
<u>635</u>	.... Non-overlapping
<u>636</u>	.... Character and graphics
<u>637</u>	.... Priority based
<u>638</u>	.... Insertion of bitmapped moving picture
<u>639</u>	.... Weighted
<u>640</u>	..... Weights vary across image (e.g., transition from foreground to background)
<u>641</u>	.... Fixed overlay pattern
<u>642</u>	.. Picking
<u>643</u>	.. Arithmetic processing of image data
<u>644</u>	... Matrix calculations
<u>645</u>	... Hierarchy of transformations (e.g., hierarchy of global and local coordinate)
<u>646</u>	.. Morphing
<u>647</u>	.. Distortion
<u>648</u>	.. Affine
<u>649</u>	.. Rotation
<u>650</u>	... Graphical user interface tools
<u>651</u>	.... Alignment functions (e.g., snapping, gravity)
<u>652</u>	.... Constrained manipulations (e.g., movement in less than all dimensions)
<u>653</u>	.... 3D manipulations
<u>654</u>	.... 2D manipulations
<u>655</u>	... Object based
<u>656</u>	... Image based (addressing)
<u>657</u>	.... By arbitrary angle
<u>658</u>	.... By 90 degrees increment
<u>659</u>	.... Image rotates in response to display device orientation
<u>660</u>	.. Scaling
<u>661</u>	... Graphical user interface tools
<u>662</u>	.... Alignment functions (e.g., snapping, gravity)
<u>663</u>	.... Constrained manipulations (i.e., movement in less than all dimensions)
<u>664</u>	.... 3D manipulations
<u>665</u>	.... 2D manipulations
<u>666</u>	... Object based
<u>667</u>	... Image based (addressing)
<u>668</u>	.... By arbitrary ratio
<u>669</u>	.... By integer multiples
<u>670</u>	.... Reduction only
<u>671</u>	.... Enlargement only
<u>672</u>	.. Translation
<u>673</u>	... Averaging technique
<u>674</u>	... Copying data to create additional rows or columns
<u>676</u>	... Graphical user interface tools

<u>677</u>	.... Alignment functions (e.g., snapping, gravity)
<u>678</u>	.... Constrained manipulations (i.e., movement in less than all dimensions)
<u>679</u>	.... 3D manipulations
<u>680</u>	.... 2D manipulations
<u>681</u>	... Object based
<u>682</u>	... Image based (addressing)
<u>683</u>	.... Sprite
<u>684</u>	.... Scrolling
<u>685</u>	..... Alphanumeric
<u>686</u>	..... Memory addressing
<u>687</u>	..... Smooth or continuous
<u>688</u>	..... Attribute changes during scrolling
<u>689</u>	.. Textual entry or display of manipulation information (e.g., enter or display degree of rotation)
<u>440</u>	. Graph generating
<u>440.1</u>	.. Real-time waveform display
<u>440.2</u>	.. Bar graph
<u>441</u>	. Shape generating
<u>442</u>	.. Curve
<u>443</u>	.. Straight line
<u>467</u>	. Character generating
<u>468</u>	.. Character geometry processing
<u>469</u>	.. Character generation using control points or hints
<u>469.1</u>	.. Character border
<u>470</u>	.. Generating character fill data from outline data
<u>471</u>	.. Alteration of stored font
<u>472</u>	... Scaling
<u>472.1</u>	.... Reduction only
<u>472.2</u>	.... Enlargement only
<u>472.3</u>	.. Calligraphic
<u>473</u>	. Animation
<u>474</u>	.. Motion planning or control
<u>475</u>	.. Temporal interpolation or processing
700	OPERATOR INTERFACE (E.G., GRAPHICAL USER INTERFACE)
<u>701</u>	. Force feedback interaction
<u>702</u>	. Tactile based interaction
<u>703</u>	. Cultural based (including language, time, monetary units displayed)
<u>704</u>	. Playback of recorded user events (e.g., script or macro playback)
<u>705</u>	. Help presentation
<u>706</u>	.. Virtual character or avatar (e.g., animated person)
<u>707</u>	.. Adaptive to user skill level
<u>708</u>	.. Context sensitive
<u>709</u>	... Coaching (e.g., animated examples, or handholding or show me execution)
<u>710</u>	... Input alert
<u>711</u>	... Tool tip (e.g., cursor position based)
<u>712</u>	... Topic roadmap or index
<u>713</u>	.... Hierarchical
<u>714</u>	.. Combining diverse help information (e.g., different sources)
<u>715</u>	.. Balloon or bubble appearance
<u>716</u>	. On screen video or audio system interface
<u>717</u>	.. Multiple diverse systems
<u>718</u>	... Mode switching interface (e.g., switching between TV and computer)
<u>719</u>	.. Video interface
<u>720</u>	... Video traversal control
<u>721</u>	... Indexed control
<u>722</u>	... Video parameter control
<u>723</u>	.. For video segment editing or sequencing
<u>724</u>	... Cut and paste operation
<u>725</u>	... Trimming

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<u>726</u>	... Effects or transitions interface
<u>727</u>	. Audio user interface
<u>728</u>	.. Audio input for on-screen manipulation (e.g., voice controlled GUI)
<u>729</u>	.. For a visually challenged user
<u>730</u>	. Presentation to audience interface (e.g., slide show)
<u>731</u>	.. Authoring tool
<u>732</u>	.. Slide manipulating or editing
<u>733</u>	. For plural users or sites (e.g., network)
<u>734</u>	.. Interactive network representation of devices (e.g., topology of workstations)
<u>735</u>	... Configuration
<u>736</u>	... Network managing or monitoring status
<u>737</u>	... User navigation between devices
<u>738</u>	.. Network resource browsing or navigating
<u>739</u>	... Selecting from a resource list (e.g., address book)
<u>740</u>	.. Remote operation of computing device
<u>741</u>	.. Access control or permission
<u>742</u>	... Interactive portal (e.g., secure point of access)
<u>743</u>	... Access rights to interactive controls
<u>744</u>	.. Interface customization or adaption (e.g., client server)
<u>745</u>	... Based on stored usage or user profile (e.g., frequency of use, cookies)
<u>746</u>	... Interface conversion
<u>747</u>	... End user based (e.g., preference setting)
<u>748</u>	. User interactive multicomputer data transfer (e.g., file transfer)
<u>749</u>	.. Downloading remote executables (e.g., Java, CGI)
<u>750</u>	. Multiple users on a single workstation
<u>751</u>	. Computer supported collaborative work between plural users
<u>752</u>	.. Interactive email
<u>753</u>	.. Computer conferencing
<u>754</u>	... Multicursor (e.g., multiple on-screen pointers)
<u>755</u>	... Floor Control
<u>756</u>	... Real Time Video
<u>757</u>	... Virtual 3D environment
<u>758</u>	... Chat room
<u>759</u>	.. Group window
<u>760</u>	. Mark up language interface (e.g., HTML)
<u>761</u>	. Plural adjacent interactive display devices
<u>762</u>	. User interface development (e.g., GUI builder)
<u>763</u>	.. Graphical or iconic based (e.g., visual program)
<u>764</u>	. On-screen workspace or object
<u>765</u>	.. Customizing multiple diverse workspace objects
<u>766</u>	.. Z order of multiple diverse workspace objects
<u>767</u>	.. Focus control of multiple diverse workspace objects
<u>768</u>	.. Translucency or transparency interface element (e.g., invisible control)
<u>769</u>	.. Data transfer operation between objects (e.g., drag and drop)
<u>770</u>	... Cut and paste
<u>771</u>	.. Instrumentation and component modeling (e.g., interactive control panel, virtual device)
<u>772</u>	... Progress or activity indicator
<u>773</u>	... Virtual input device (e.g., virtual keyboard)
<u>774</u>	.. Ticker metaphor
<u>775</u>	.. Office layout metaphor (e.g., filing cabinet, desk)
<u>776</u>	.. Indexed book or notebook metaphor
<u>777</u>	.. Tab metaphor (e.g., property sheet)
<u>778</u>	.. Multiple virtual screen or desktop switching
<u>779</u>	.. Task bar or desktop control panel
<u>780</u>	.. Entry field (e.g., text entry field)
<u>781</u>	.. Window or viewpoint
<u>782</u>	... 3D Perspective view of window layout
<u>783</u>	... On-screen window list or index

<u>784</u>	... Window scrolling
<u>785</u>	.... Autoscroll
<u>786</u>	.... Scroll tool (e.g., scroll bar)
<u>787</u>	..... With content attributes on scroll tool
<u>788</u>	... Layout modification (e.g., move or resize)
<u>789</u>	.... Based on usage or user profile (e.g., frequency of use)
<u>790</u>	.... Overlap control
<u>791</u>	..... Always on top
<u>792</u>	..... Tiling or split pane
<u>793</u>	..... Cascading
<u>794</u>	..... Priority or overlap change (e.g., z-order)
<u>795</u>	..... Minimizing or send to bottom
<u>796</u>	..... Bring to top
<u>797</u>	..... Viewing lower priority windows (e.g., overlapped windows)
<u>798</u>	... Combining moving and resizing operations (e.g., moving causes resizing)
<u>799</u>	... Moving (e.g., translating)
<u>800</u>	... Resizing (e.g., scaling)
<u>801</u>	..... Contained object scale change
<u>802</u>	... Focus control
<u>803</u>	... Window differentiation
<u>804</u>	... Interwindow link or communication
<u>805</u>	... On-screen link or communication (e.g., cue)
<u>806</u>	... Window memory structure
<u>807</u>	... Stored priority attribute
<u>808</u>	.. Pop-up control
<u>809</u>	.. Dialog box
<u>810</u>	.. Menu or selectable iconic array (e.g., palette)
<u>811</u>	... Based on usage or user profile (e.g., frequency of use)
<u>812</u>	.... Preselection (e.g., best guess before mouse click)
<u>813</u>	.... Default selection item
<u>814</u>	... Limited time selection opportunity
<u>815</u>	... Sizing modification (e.g., scaling)
<u>816</u>	... Partial input lookup (e.g., partial string lookup)
<u>817</u>	... Context location indication (e.g., previous or next menu item indication)
<u>818</u>	.... Simultaneous next and previous indication (e.g., menu road map)
<u>819</u>	.... Next menu indication
<u>820</u>	.... Previous menu indication
<u>821</u>	... Emphasis
<u>822</u>	.... Preselection emphasis
<u>823</u>	.... Selection or confirmation emphasis
<u>824</u>	.... Unavailable emphasis
<u>825</u>	... Dynamically generated menu items
<u>826</u>	... Add on item (e.g., software developed, customized)
<u>827</u>	... Mnemonic (e.g., accelerator key)
<u>828</u>	... Partial menu display (e.g., one menu item at a time)
<u>829</u>	.... Advancing to next menu item in the same menu
<u>830</u>	..... Scrolling (e.g., spin dial)
<u>831</u>	.... With specific input device
<u>832</u>	... Analog selection style
<u>833</u>	... Slider control
<u>834</u>	... Radial based (e.g., radial or pie menu)
<u>835</u>	... Selectable iconic array
<u>836</u>	.... 3D icons
<u>837</u>	.... Compound or aggregate icon
<u>838</u>	.... Thumbnail or scaled image
<u>839</u>	.... Imitating real life object
<u>840</u>	... Using button array
<u>841</u>	... Sub-menu structure
<u>842</u>	.... Tear off

<u>843</u>	.... Pull down
<u>844</u>	... Timed
<u>845</u>	... Multiple selections in a single menu
<u>846</u>	.. Non-array icons
<u>847</u>	... Shortcut
<u>848</u>	.. Interface represented by 3D space
<u>849</u>	... Individual object
<u>850</u>	... Navigation within 3D space
<u>851</u>	.... On-screen navigation control
<u>852</u>	... Picking 3D objects
<u>853</u>	.. Hierarchy or network structure
<u>854</u>	... Navigation within structure
<u>855</u>	.... On-screen roadmap or index
<u>856</u>	.. Cursor
<u>857</u>	... Pointer direction adjustment
<u>858</u>	... Automatic position adjustment
<u>859</u>	... Status indicator
<u>860</u>	.... Selection emphasis
<u>861</u>	.... Dynamically changed appearance (e.g., animated or live action)
<u>862</u>	... Proximity detection
<u>863</u>	. Gesture-based
<u>864</u>	. For a small display screen (e.g., personal digital assistant, palm-top)
<u>865</u>	. Miscellaneous interface for the handicapped or disabled user
<u>866</u>	. Miscellaneous customization or adaptation
<u>867</u>	SCREEN SAVER DISPLAY
<u>156</u>	DISPLAY PERIPHERAL INTERFACE INPUT DEVICE
<u>157</u>	. Cursor mark position control device
<u>158</u>	.. Including orientation sensors (e.g., infrared, ultrasonic, remotely controlled)
<u>159</u>	.. Having variable cursor speed
<u>160</u>	.. Cursor key
<u>161</u>	.. Joystick
<u>162</u>	.. Positional storage means
<u>163</u>	.. Mouse
<u>164</u>	... Rotatable ball detector
<u>165</u>	.... Photosensor encoder
<u>166</u>	... Optical detector
<u>167</u>	.. Trackball
<u>168</u>	. Including keyboard
<u>169</u>	.. Portable (i.e., handheld, calculator, remote controller)
<u>170</u>	.. Light source associated with each key
<u>171</u>	.. Having foreign language capability (e.g., Japanese, Chinese)
<u>172</u>	.. Having programmable function key
<u>173</u>	. Touch panel
<u>174</u>	.. Including impedance detection
<u>175</u>	.. Including optical detection
<u>176</u>	.. Transparent substrate having light entrapment capability (i.e., waveguides)
<u>177</u>	.. Including surface acoustic detection
<u>178</u>	.. With alignment or calibration capability (i.e., parallax problem)
<u>179</u>	. Stylus
<u>180</u>	. Light pen for CRT display
<u>181</u>	.. CRT having tracking capability
<u>182</u>	. Light pen for fluid matrix display panel
<u>183</u>	. Light pen for controlling plural light-emitting display elements (e.g., LED, lamps)
<u>184</u>	. Mechanical control (e.g., rotatable knob, slider)
<u>501</u>	COMPUTER GRAPHIC PROCESSING SYSTEM
<u>502</u>	. Plural graphics processors
<u>503</u>	.. Coprocessor (e.g., graphic accelerator)
<u>504</u>	.. Master-slave processors
<u>505</u>	.. Parallel processors (e.g., identical processors)

<u>506</u>	.. Pipeline processors
<u>519</u>	. Integrated circuit (e.g., single chip semiconductor device)
<u>520</u>	. Interface (e.g., controller)
<u>522</u>	. Graphic command processing
<u>530</u>	COMPUTER GRAPHICS DISPLAY MEMORY SYSTEM
<u>531</u>	. Graphic display memory controller
<u>532</u>	.. Plural memory controllers
<u>533</u>	.. Using different access modes
<u>534</u>	.. Memory access timing signals
<u>535</u>	.. Memory arbitration
<u>536</u>	. Plural storage devices
<u>537</u>	.. Data transfer between memories
<u>538</u>	... Data transfer between system memory display memory
<u>539</u>	.. Double buffered
<u>540</u>	.. Interleaved
<u>541</u>	. Shared memory
<u>542</u>	.. Unified memory architecture (e.g., UMA)
<u>543</u>	. Memory allocation
<u>544</u>	. Memory partitioning
<u>545</u>	. Frame buffer
<u>546</u>	.. Multi-format frame buffer
<u>547</u>	.. Memory for storing video data
<u>548</u>	.. Off-screen memory
<u>549</u>	.. Color memory
<u>550</u>	... Multiple planes
<u>551</u>	.. Character memory
<u>552</u>	. Texture memory
<u>553</u>	. Display list memory
<u>554</u>	. Multi-port memory
<u>555</u>	. For storing compressed data
<u>556</u>	. For storing condition code, flag or status
<u>557</u>	. Cache
<u>558</u>	. First in first out (i.e., FIFO)
<u>559</u>	. Register
<u>560</u>	. Row buffer (e.g., line memory)
<u>561</u>	. Logical operations
<u>562</u>	.. Bit block transfer
<u>563</u>	.. Mask data operation
<u>564</u>	. Addressing
<u>565</u>	.. Using memory for storing address information
<u>566</u>	.. Address manipulation
<u>567</u>	... Using decoding
<u>568</u>	... Address translation (e.g., between virtual and physical addresses)
<u>569</u>	.. For 2D coordinate to linear address conversion
<u>570</u>	.. Page mode
<u>571</u>	.. Memory addresses arranged in matrix row and column addresses)
<u>572</u>	.. Address generator
<u>573</u>	... Plural address generators
<u>574</u>	... Read/Write address generator
<u>204</u>	DISPLAY DRIVING CONTROL CIRCUITRY
<u>205</u>	. Physically integral with display elements
<u>206</u>	.. Having common base or substrate
<u>207</u>	. Light detection means (e.g., with photodetector)
<u>690</u>	. Intensity or color driving control (e.g., gray scale)
<u>691</u>	.. Temporal processing (e.g., pulse width variation over time
<u>692</u>	... Binary weighted
<u>693</u>	... Non-binary weighted
<u>694</u>	.. Spatial processing (e.g., patterns or subpixel configuration)
<u>695</u>	... Subpixels have different shapes

<u>696</u>	... Changing of subpixel location over time
<u>697</u>	.. Including optical means
<u>698</u>	. Adjusting display pixel size or pixels per given area (i.e., resolution)
<u>699</u>	.. Controller automatically senses monitor resolution
<u>208</u>	. Waveform generator coupled to display elements
<u>209</u>	.. Field period polarity reversal
<u>210</u>	.. Having three or more voltage levels
<u>211</u>	. Display power source
<u>212</u>	.. Regulating means
<u>213</u>	.. Synchronizing means
<u>214</u>	. Controlling the condition of display elements
<u>215</u>	.. Including priming means
<u>1.1</u>	PLURAL DISPLAY SYSTEMS
<u>1.2</u>	. Data transmitted or received at surface of display
<u>1.3</u>	. Tiling or modular adjacent displays
<u>2.1</u>	. Remotely located
<u>2.2</u>	.. Presentation of similar images
<u>2.3</u>	.. Wireless connection
<u>3.1</u>	. Diverse systems (e.g., CRT or LCD interface)
<u>3.2</u>	.. Frame, field or scan rate conversion
<u>3.3</u>	.. Number of pixels per row or column conversion (i.e., resolution conversion)
<u>3.4</u>	... Controller automatically senses monitor resolution
<u>4</u>	SINGLE DISPLAY SYSTEM HAVING STACKED SUPERIMPOSED DISPLAY DEVICES (E.G., TANDEM)
<u>5</u>	. Diverse display devices
<u>6</u>	. Three-dimensional arrays
<u>7</u>	IMAGE SUPERPOSITION BY OPTICAL MEANS (E.G., HEADS-UP DISPLAY)
<u>8</u>	. Operator body-mounted heads-up display (e.g., helmet mounted display)
<u>9</u>	. Plural image superposition
<u>10</u>	DATA RESPONSIVE CRT DISPLAY CONTROL
<u>11</u>	. CRT provides display control
<u>12</u>	. Data responsive deflection and intensity control
<u>13</u>	. Data responsive deflection control
<u>14</u>	.. X and Y axis deflection control
<u>15</u>	.. Curvilinear deflection control (e.g., lissajous)
<u>16</u>	.. Stroke or vector
<u>17</u>	... Strokes for forming characters
<u>18</u>	... Up/down counter
<u>19</u>	.. Impedance Array
<u>20</u>	. Data responsive intensity control
<u>21</u>	.. Magnetic element array
<u>22</u>	. Color display
<u>23</u>	. Graphic and alphanumeric display
<u>24</u>	. Graphic display
<u>25</u>	. Alphanumeric display
<u>26</u>	.. Character generator
<u>27</u>	. Combined with storage means
<u>28</u>	.. Addressing
<u>29</u>	. Delay line
<u>30</u>	PLURAL PHYSICAL DISPLAY ELEMENT CONTROL SYSTEM (E.G., NON-CRT)
<u>31</u>	. Physically movable array
<u>32</u>	. Optical means interposed in viewing path (e.g., filters, lens, etc.)
<u>33</u>	. Segmented display elements
<u>34</u>	.. Seven segment display
<u>35</u>	.. Bar graph
<u>36</u>	... Electroluminescent display elements
<u>37</u>	... Gas discharge display segments (e.g., plasma)
<u>38</u>	... Liquid crystal display segments
<u>39</u>	... Light-emitting diode segments (LEDS)